

Performance of SBA-15 porous material as a novel nanocarrier for control release of thyme oil in low density polyethylene active packaging films

Constantinos E. Salmas^{1*}, Maria Baikousi¹, Vassilios K. Karabagias², Ioanna Karageorgou², George Iordanidis², Charmpas Emmanouil-Konstantinos¹, Areti Leontiou², Andreas Karydis-Messinis¹, Nikolaos E. Zafeiropoulos¹, George Kehayias², Charalampos Proestos³, and Aris E. Giannakas^{2*}

- 1 Department of Material Science and Engineering, University of Ioannina, 45110 Ioannina, Greece; mbaikou@uoi.gr (M.B.); karydis.and@gmail.com (A.K.-M.); nzafirop@uoi.gr (N.E.Z.); emmanouil.charmpas@gmail.com (E-K.C.)
 - 2 Department of Food Science and Technology, University of Patras, 30100 Agrinio, Greece; vkarampagias@upatras.gr (V.K.K.); iokarageorgou@gmail.com (I.K.); up1076521@ac.upatras.gr (G.I.); aleontiu@upatras.gr (A.L.); gkechagi@upatras.gr (G.K.)
 - 3 Laboratory of Food Chemistry, Department of Chemistry, National and Kapodistrian University of Athens Zografou, 15771 Athens, Greece; harpro@chem.uoa.gr (C.P.)
- * Correspondence: ksalmas@uoi.gr (C.E.S.); agiannakas@upatras.gr (A.E.G.)

Table S1 Statistical analysis on lipid oxidation

Hypothesis Test Summary				
	Null Hypothesis	Test	Sig. ^{a,b}	Decision
1	The distribution of Day_0 is the same across categories of Treatment.	Independent-Samples Kruskal-Wallis Test	1.000	Retain the null hypothesis.
2	The distribution of Day_2 is the same across categories of Treatment.	Independent-Samples Kruskal-Wallis Test	0.513	Retain the null hypothesis.
3	The distribution of Day_4 is the same across categories of Treatment.	Independent-Samples Kruskal-Wallis Test	0.127	Retain the null hypothesis.
4	The distribution of Day_6 is the same across categories of Treatment.	Independent-Samples Kruskal-Wallis Test	0.513	Retain the null hypothesis.
5	The distribution of Day_8 is the same across categories of Treatment.	Independent-Samples Kruskal-Wallis Test	0.050	Reject the null hypothesis.

a. The significance level is ,050.

b. Asymptotic significance is displayed.

Table S2 Statistical analysis on Heme Fe

		Hypothesis Test Summary		
	Null Hypothesis	Test	Sig. ^{a,b}	Decision
1	The distribution of Day_0 is the same across categories of Treatment.	Independent-Samples Kruskal-Wallis Test	1,000	Retain the null hypothesis.
2	The distribution of Day_2 is the same across categories of Treatment.	Independent-Samples Kruskal-Wallis Test	,050	Reject the null hypothesis.
3	The distribution of Day_4 is the same across categories of Treatment.	Independent-Samples Kruskal-Wallis Test	,050	Reject the null hypothesis.
4	The distribution of Day_6 is the same across categories of Treatment.	Independent-Samples Kruskal-Wallis Test	,513	Retain the null hypothesis.
5	The distribution of Day_8 is the same across categories of Treatment.	Independent-Samples Kruskal-Wallis Test	,050	Reject the null hypothesis.

a. The significance level is ,050.

b. Asymptotic significance is displayed.

Table S3 Correlation Pearson Heme Fe and Lipid Oxidation

		Correlations	
		Heme_Day_8	Lipid_Day_8
Heme_Day_8	Pearson Correlation	1	-,930**
	Sig. (2-tailed)		,007
	Sum of Squares and Cross-products	1,377	-,183
	Covariance	,275	-,037
	N	6	6
Lipid_Day_8	Pearson Correlation	-,930**	1
	Sig. (2-tailed)	,007	
	Sum of Squares and Cross-products	-,183	,028
	Covariance	-,037	,006
	N	6	6

** . Correlation is significant at the 0.01 level (2-tailed).

Table S4 Statistical Analysis on pH

Hypothesis Test Summary				
	Null Hypothesis	Test	Sig. ^{a,b}	Decision
1	The distribution of Day_0 is the same across categories of Treatment.	Independent-Samples Kruskal-Wallis Test	1,000	Retain the null hypothesis.
2	The distribution of Day_2 is the same across categories of Treatment.	Independent-Samples Kruskal-Wallis Test	,034	Reject the null hypothesis.
3	The distribution of Day_4 is the same across categories of Treatment.	Independent-Samples Kruskal-Wallis Test	,025	Reject the null hypothesis.
4	The distribution of Day_6 is the same across categories of Treatment.	Independent-Samples Kruskal-Wallis Test	,025	Reject the null hypothesis.
5	The distribution of Day_8 is the same across categories of Treatment.	Independent-Samples Kruskal-Wallis Test	,050	Reject the null hypothesis.

a. The significance level is ,050.

b. Asymptotic significance is displayed.

Table S5 Statistical Analysis on TVC tests

Hypothesis Test Summary				
	Null Hypothesis	Test	Sig. ^{a,b}	Decision
1	The distribution of Day_0 is the same across categories of Treatment.	Independent-Samples Kruskal-Wallis Test	1,000	Retain the null hypothesis.
2	The distribution of Day_2 is the same across categories of Treatment.	Independent-Samples Kruskal-Wallis Test	,513	Retain the null hypothesis.
3	The distribution of Day_4 is the same across categories of Treatment.	Independent-Samples Kruskal-Wallis Test	,513	Retain the null hypothesis.
4	The distribution of Day_6 is the same across categories of Treatment.	Independent-Samples Kruskal-Wallis Test	,025	Reject the null hypothesis.

a. The significance level is ,050.

b. Asymptotic significance is displayed.

Table S6 Statistical Analysis of Sensory Evaluation Data

Odor

Hypothesis Test Summary				
	Null Hypothesis	Test	Sig. ^{a,b}	Decision

1	The distribution of Odor_Day_0 is the same across categories of Treatment_Odor_Day.	Independent-Samples Kruskal-Wallis Test	1,000	Retain the null hypothesis.
2	The distribution of Odor_Day_2 is the same across categories of Treatment_Odor_Day.	Independent-Samples Kruskal-Wallis Test	,110	Retain the null hypothesis.
3	The distribution of Odor_Day_4 is the same across categories of Treatment_Odor_Day.	Independent-Samples Kruskal-Wallis Test	,365	Retain the null hypothesis.
4	The distribution of Odor_Day_6 is the same across categories of Treatment_Odor_Day.	Independent-Samples Kruskal-Wallis Test	,014	Reject the null hypothesis.

a. The significance level is ,050.

b. Asymptotic significance is displayed.

Colour
Hypothesis Test Summary

	Null Hypothesis	Test	Sig. ^{a,b}	Decision
1	The distribution of Colour_Day0 is the same across categories of Treatment_Colour_Day.	Independent-Samples Kruskal-Wallis Test	1,000	Retain the null hypothesis.
2	The distribution of Colour_Day2 is the same across categories of Treatment_Colour_Day.	Independent-Samples Kruskal-Wallis Test	,110	Retain the null hypothesis.
3	The distribution of Colour_Day4 is the same across categories of Treatment_Colour_Day.	Independent-Samples Kruskal-Wallis Test	,365	Retain the null hypothesis.
4	The distribution of Colour_Day6 is the same across categories of Treatment_Colour_Day.	Independent-Samples Kruskal-Wallis Test	,014	Reject the null hypothesis.

a. The significance level is ,050.

b. Asymptotic significance is displayed.

Hypothesis Test Summary

	Null Hypothesis	Test	Sig. ^{a,b}	Decision
--	-----------------	------	---------------------	----------

1	The distribution of Cohetion_Day0 is the same across categories of Treatment_Cohetion_Day.	Independent-Samples Kruskal-Wallis Test	1,000	Retain the null hypothesis.
2	The distribution of Cohetion_Day2 is the same across categories of Treatment_Cohetion_Day.	Independent-Samples Kruskal-Wallis Test	,010	Reject the null hypothesis.
3	The distribution of Cohetion_Day4 is the same across categories of Treatment_Cohetion_Day.	Independent-Samples Kruskal-Wallis Test	,008	Reject the null hypothesis.
4	The distribution of Cohetion_Day6 is the same across categories of Treatment_Cohetion_Day.	Independent-Samples Kruskal-Wallis Test	,002	Reject the null hypothesis.

a. The significance level is ,050.

b. Asymptotic significance is displayed.